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Six new earthworm species of the southern African genus *Proandricus* Plisko, 1992 (Oligochaeta: Microchaetidae)

by

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ABSTRACT

The following new species of *Proandricus* Plisko, 1992, are described and illustrated: *alatus*, *bourquini*, *briani*, *comptus*, *setosus*, *sirgeli*. Biological notes for each species and their relationships are discussed. Characters of *Proandricus* are discussed.

INTRODUCTION

The genus *Proandricus* Plisko, 1992, was erected to accommodate proandric species, new and previously included in *Microchaetus* Rapp, 1849. Further species were described in subsequent papers (Plisko 1993 1994). Six more new species have been identified in the Oligochaeta collection of the Natal Museum and are described below. *Proandricus* now has a total of 33 species, all known from southern Africa (South Africa: Eastern Transvaal, Transvaal, Natal, Transkei, Eastern and Western Cape Provinces; Lesotho: Maluti and Masite Mountain ranges).

MATERIAL AND METHODS

Most of the material was collected by myself, with the assistance of Dr B. R. Stuckenberg and Mr T. Liversage. One species was collected by Dr W. F. Sirgel. For anatomical study, dorsal dissections were made. Specimens were photographed using a Wild M3Z photomicroscope; drawings were made with the aid of a drawing-tube attached to a Wild M5 stereomicroscope.

GLOSSARY AND ABBREVIATIONS

The terms, conventions and definitions employed in this paper are in accordance with those of Plisko (1993). Additional abbreviations are:

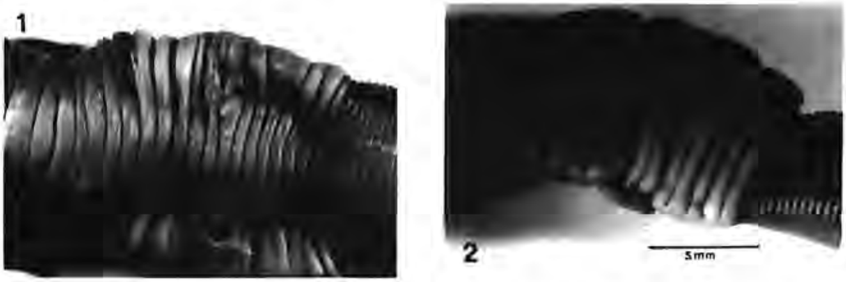
BRS	–	B. R. Stuckenberg
NMSA/Olig.	–	Natal Museum Oligochaeta Collection
TL	–	T. Liversage

TAXONOMY

Proandricus Plisko, 1992

Proandricus Plisko, 1992: 354. Type species: *P. thornvillensis* Plisko, 1992 by original designation.

Diagnosis: *Internal*: One pair testes and one pair spermiductal funnels in segment 10 (proandric condition). Spermiductal funnels free, or enclosed in one or two separated testis sacs. One oesophageal gizzard in segment 7. Calciferous glands present, in region of 9–10. One pair meganephridia per segment. Spermathecae in one or several pairs per segment, in one or more segments. Genital glands present or absent. Prostate absent. *External*: Setae lumbricine, paired. Nephropores in, or near, *cd* setal lines. Male pores intraclitellar. Paired female pores on 14. Clitellum saddle-shaped. Tubercula pubertatis present. Papillae present or absent. Spermathecal pores in one or in several intersegmental furrows. Dorsal pores absent.



Figs 1–2. *Proandricus alatus* sp. n., clitellar region. 1. Ventral view. 2. Lateral view, with tuberculum pubertatis.

Proandricus alatus sp. n.

Figs 1–2

Etymology: L. *alatus* = winged. Refers to the tubercula pubertatis, which resemble wings.

Material examined: **KwaZulu-Natal**: *Holotype* NMSA/Olig.02300, 20 km N. of Melmoth (28°32'S:31°25'E), grassland with tall grasses, near the road, from sandy moist soil, 16 December 1995, JDP & TL leg. *Paratypes*: NMSA/Olig.02306, 3 clitellate (abscised postclitellarly), 1 juvenile collected with holotype.

Distribution: Known only from the type locality.

Description (Based on holotype and paratypes):

External characters:

General: Body cylindrical, firm. *Colour*: In life dorsally brown, ventrally grey; alcohol preserved dorsally grey with brownish tint. *Dimensions*: Holotype: In life, slightly stretched *ca.* 750 mm long; preserved, contracted 380 mm long, 9 mm wide at 10, 12 mm at tubercula pubertatis; paratypes: clitellate 85+ up to 250+ mm long, 7 mm wide at 10, 13 at tubercula pubertatis; juvenile 80 mm long, 3 mm wide. *Segment number*: Holotype 625; clitellate paratype 465+. *Prostomium*: Prolobous, very small, separated from first segment, with a few longitudinal grooves. *Segmentation*: Secondary annulation present; 1–2 simple with longitudinal grooves; 3 simple; 4–8 with 2 ringlets similar in size and appearance; 9 with two ringlets, first longer than second; 10–11 simple, dorsally annulated; clitellar and postclitellar simple. *Setae*: Minute, closely paired; first pairs of *ab* on first ringlet of 4; *ab* = *cd*; *aa* > *bc*; on 10, 12 and 18 *ab* associated with papillae. *Nephridial pores*: Conspicuous in *cd* setal lines; first pair in 2/3 intersegmental furrow. *Female pores*: A pair of small openings close to 13/14 intersegmental furrow. *Male pores*: Probably in 18 between papillae and tubercula pubertatis, where there are small openings between two swellings. *Spermathecal pores*: Tiny openings in 11/12 12/13 13/14 intersegmental furrows.

Clitellar region (Figs 1–2): *Clitellum*: Saddle-shaped, yellowish white, not clearly bordered anteriorly and posteriorly; on 12–25, clearly segmented; ventral edges of 13–1/n16 and 1/n20–24 extend below *cd* setal lines, on 1/n16–1/n20 are partly joined with tubercula pubertatis. *Tubercula pubertatis*: On 1/n16–1/n20; large, nearly square swollen ridges; each commences much above *cd* lines, extending to midway between *bc* setal lines; expanding dorsally into form of protruding, narrow wings, rimmed and clearly separated from clitellum. *Papillae*: 3 pairs, on *ab* setae; on 10 and 12 small, on 18 prominent.

Internal characters:

Septa: 4/5 thin, 5/6 very much thickened, 6/7 thin, 7/8 and 8/9 thickened very much, muscular, similar in size and appearance. *Gizzard*: Large, muscular. *Calciferous glands*: Not stalked, dorsolaterally adherent to oesophagus in 9; dorsally separated by very narrow groove; ventrally broadly separated. *Intestine*: Commences in 13. *Typhlosole*: In holotype commences in 14 as thin V-shaped tube, gradually changing into narrow U-shape; terminates in area of 345. *Dorsal blood vessel*: In 5–6 doubled, close; in 7 doubled only in posterior part; 8 doubled, separated; 9 doubled and cordiform; 10 doubled; single when crossing septa and posterior to 10. *Paired dorsoventral vessels*: 4–8 thin tubes; 9–11 enlarged, moniliform. *Nephridia*: Meganephridia; very thin tubes coiled in loops with elongated, large caeca, posteriorly V-shaped.

Reproductive organs: *Spermiductal funnels*: A pair of large funnels, enclosed in sac, placed deeply under ventral blood vessel. *Seminal vesicles*: One pair of large, folded sacs, in 10, projecting into 11. *Spermathecae*: In 12, 13 and 14; minuscule, curved ampullae; a pair per segment; openings at septa 11/12 12/13 13/14. *Genital glands*: Paired, folded glands; in 9 moderate, large 2- or 3-folded in 10, 18, 19.

Biological notes: Found at *ca.* 800 m in rainy weather. Collected by digging in sandy soil under tall grasses. Both old and freshly made, large casts were noted as common in the grassland and near the road, confirming species movement in the soil. Sperm was present in the spermiductal funnels of dissected specimens, showing this species to be sexual active at the beginning of summer. Associated with *Tritogenia* species.

Discussion: Similar to *P. marleyi* (Michaelsen, 1928), which has been recorded from nearby at Melmoth. Both species have spermiductal funnels enclosed in one testis sac, and the septa 5/6 7/8 8/9 very much thickened. They differ, however, in the form of the dorsal blood vessel, and the position and number of spermathecae. A peculiarity of *alatus* is the position of the spermiductal funnels beneath the ventral vessel; no other microchaetid has this feature.

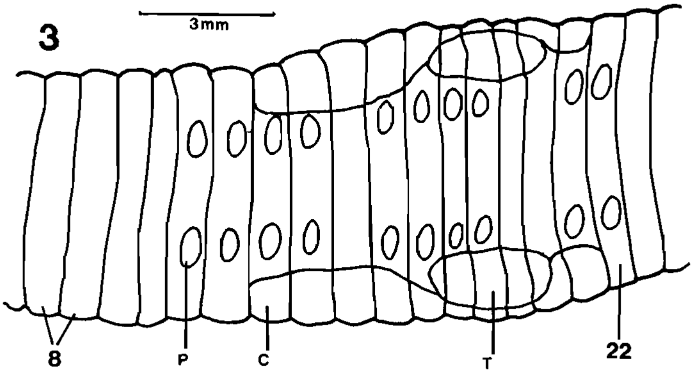


Fig. 3. *Proandricus bourquini* sp. n., clitellar region, ventral view. (C = clitellum; T = tuberculum pubertatis; P = papilla; numbers refer to segments.)

Proandricus bourquini sp. n.

Fig. 3

Etymology: Named for Dr O. Bourquin (Natal Parks Board, Pietermaritzburg), who organised the field trip to Incandu Forest Reserve, where the type material was collected.

Material examined (all collected by JDP): **KwaZulu-Natal**: *Holotype*: NMSA/Olig.02313, Newcastle area (27°42'S:29°59'E), Incandu Forest Reserve at *ca.* 1830 m, grassland, on bank of Ulumbi River, from very wet soil, 29 January 1996. *Paratypes*: Incandu Forest Reserve: NMSA/Olig.02312, grassland plateau above Ulumbi River, from moist soil, 31 January 1996, 1 clitellate; NMSA/Olig.02314, grassland, moist soil, 31 January 1996, 1 clitellate, 5 juveniles; NMSA/Olig.02315, grassland plateau, near water seepage, 30 January 1996, 1 juvenile; NMSA/Olig.02316, grassland, near Rest Camp, dry soil, 30 January 1996, 3 juveniles; NMSA/Olig.02317, 5 km S.E. from Rest Camp, riverine bush, 31 January 1996, 1 clitellate.

Distribution: Known only from the type locality.

Description (based on holotype and paratypes):

External characters:

General: Cylindrical along whole body length. *Colour*: In life dark grey; alcohol preserved whitish grey. *Dimensions*: Preserved, contracted holotype 98 mm long, 5 mm wide at 10, 6 mm in region of tubercula pubertatis; clitellate paratypes 75–98 mm long; juveniles 30–50 mm long. *Segment number*: Holotype 134; clitellatae paratypes 123–141; juvenile 106–130. *Prostomium*: Prolobous, small. *Segmentation*: Secondary annulation present: 1 and 2 with irregular longitudinal grooves; 3–8 with 2 simple ringlets, similar in size and appearance; 9 with 2 ringlets, first longer than second; 10–11 and clitellar segments simple; postclitellar simple or randomly annulated. *Setae*: Conspicuous, moderate in size, paired in regular rows; first pairs on 3, subsequent pairs of segments 4–9 on first ringlet. *Nephridial pores*: Obvious, below *c* setal lines; first pair in 2/3 intersegmental furrow. *Female pores*: On 14, small openings between *bc* setal lines. *Male pores*: On 17, in tubercula pubertatis area, distinct. *Spermathecal pores*: In two intersegmental furrows, 9/10 10/11; one pair in 9/10, 2–3 openings at each side in 10/11.

Clitellar region (Fig. 3): *Clitellum*: Saddle-shaped, segmented, whitish grey; on 12–21; on 12–15 and 21 ventral edges extend to rows of papillae, on 16–20 to dorsal edges of tubercula pubertatis. *Tubercula pubertatis*: On 1/n16–1/n20, below clitellar edges and *c* setal lines; flat bands, clearly divided by intersegmental furrows, with narrow grooves at dorsal borders. *Papillae*: In holotype on 10–13, 15–18, 21–22; in paratypes on 10–18, 21–22 or 10–18; small, white swellings, paired, in *ab* setal lines, associated with genital glands.

Internal characters:

Septa: 4/5, 7/8, 8/9 thickened moderately, similar in size and appearance; other septa thin. *Gizzard*: Large, muscular. *Calciferous glands*: In 9, dorsolateral, widely separated dorsally and ventrally. *Intestine*: Commences in 13; in 22–28 seven pairs of external, dorsal, irregular diverticula. *Typhlosole*: U-shaped, thick tube, commences in 22–23; terminates in holotype in 60, in dissected paratype in 63. *Dorsal blood vessel*: Double in 4–10; 4–7 doubled, close, in 8 doubled, separated; in 9 cordiform organ, in 10 doubled, thick, close; crossing septa in 4–10 double; in the following segments simple. *Paired dorsoventral vessels*: Thin tubes in 4–8; enlarged, moniliform in 9–11. *Nephridia*: One pair of meganephridia per segment; paired small tufts of coiled tubules, with thin, elongated tube and caeca.

Reproductive organs: *Spermiductal funnels*: A pair of funnels enclosed in two sacs, closely connected with vesiculae seminales. *Seminal vesicles*: One pair in 10, large sacs projecting into 11. *Spermathecae*: Globular, with thin neck, longer than spermatheca; different in size, similar in appearance; in two segments; one, two or three at each side; first pair close to septa 9/10; second two pairs and single spermatheca close to 10/11. *Ovaries*: in 13. *Genital glands*: Moderate in size, flat glands associated with *ab* setae and papillae, in 10–13, 15–18, 21–22 or 10–17.

Biological notes: Collected from six widely separated sites in the Incandu Forest Reserve. This Reserve is predominately grassland, with small patches of indigenous forest and riverine bush along the Ulumbi River. Specimens were found between the roots of tall grasses in moderately dry soil, at seepage from moist and saturated soil, and on the river bank. In wet sites, near the river, acanthodrilids were associated with this new species. In drier localities, *bourquini* occurred alone. Populations appeared to be small, and only small series were collected at individual sites. No casts were noted on the surface. In two dissected specimens sperm was present in spermathecae, in one specimen spermathecae were empty.

Discussion: This species is similar to *P. lesothoensis* (Reinecke & Ryke, 1967). Both are characterised by the position of the clitellum on 12–21, the presence of diverticula, and spermathecal pores in 9/10, 10/11. It differs in the arrangement of setae and shape of spermathecae.

The position of the spermathecal pores in intersegmental furrows immediately before or behind the segment in which spermiductal funnels are located, is rare in microchaetids. Within *Proandricus* this character was found in *lesothoensis* (9/10 and 10/11), and in *pajori* (Plisko, 1993) in 10/11. *P. bourquini* is the third species with this character state.

Proandricus briani sp. n.

Figs 4–5

Etymology: Named for Dr Brian Stuckenberg, Director *emeritus* of the Natal Museum, who assisted me with the collection of the type series.

Material examined: **Eastern Cape**: *Holotype* NMSA/Olig.00553, Middledrift (32°48'S:27°01'E), 26 km NW. of King William's Town on road 63, from grassland, dry soil (many casts present on surface), 20 January 1990, JDP & BRS leg. *Paratypes*: NMSA/Olig.00554 11 clitellate, 1 juvenile, collected with holotype.

Distribution: Known only from the type locality.

Description (based on holotype and paratypes):

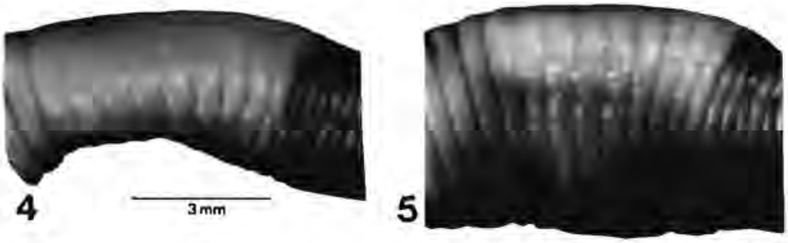
External characters:

General: Body cylindrical, firm. *Colour*: In life dorsally brownish, ventrally grey. Alcohol preserved whitish grey. *Dimensions*: Holotype preserved, slightly stretched 154 mm long, 6 mm wide at 10, 7 mm at tubercula pubertatis; clitellate paratype 150 mm long. *Segment number*: Holotype 304; paratype 220. *Prostomium*: Prolobous, very small, distinctly separated from first segment, with a few longitudinal grooves. *Segmentation*: Secondary annulation present; 1–2 simple with longitudinal grooves; 3 simple; 4–8 with 2 ringlets of similar size and appearance; 9 with two ringlets, first longer than second; 10–11 simple; clitellar and postclitellar segments simple. *Setae*: Minute, paired; first pairs on 3; *ab* > *cd*; *aa* > *bc*. *Nephridial pores*: Conspicuous in *cd* setal lines; first pair in 3/4 intersegmental furrow. *Female pores*: A pair of small openings in 13/14 intersegmental furrow in front of *ab* setal lines. *Male pores*: In 14/15 intersegmental furrow, between two prominent swellings on 14 and 15. *Spermathecal pores*: Tiny openings in 11/12 12/13 13/14 intersegmental furrows.

Clitellar region (Figs 4–5) *Clitellum*: Saddle-shaped, yellowish white, clearly bordered anteriorly and posteriorly; on 12–22, segmented; ventral edges extended below *cd* setal lines. *Tubercula pubertatis*: Narrow, swollen strips, between *ab* and *cd* setal lines; on 16–19, not rimmed or clearly separated from clitellum. *Papillae*: 2 pairs, on *ab* setae, on 10 and 22; small swellings with tiny depressions; on holotype papillae with depressions only on 22; on three paratypes this condition noted on both pairs.

Internal characters:

Septa: 4/5 7/8 8/9 much thickened, muscular, similar in size and appearance, although first one slightly thicker than 7/8 or 8/7. *Gizzard*: Moderate in size, muscular. *Calciferous glands*: Not stalked; dorsolaterally adherent to oesophagus in 9–10; externally parted by septum 9/10 into two appendages; both parts dorsally and ventrally separated by very narrow longitudinal grooves. *Intestine*: Commences in 13. *Typhlosole*: Commences in 19 as narrow U-shaped tube, gradually changing into



Figs 4–5. *Proandricus briani* sp. n., clitellar region. 4. Lateral view. 5. Ventral view, with tuberculum pubertatis.

ribbon-shape; terminates in area of 164. *Dorsal blood vessel*: In 4–5 single; in 6–7 doubled, close; 8 doubled, separated; 9 doubled, cordiform; single when crossing septa and posterior to 10. *Paired dorsoventral vessels*: 4–8 thin tubes; 9–11 enlarged, moniliform. *Nephridia*: Meganephridia; thin, coiled loops with elongated, large caeca.

Reproductive organs: *Spermiductal funnels*: A pair of large funnels, enclosed in two large sacs, closely connected to each other and to vesicula seminales of 10. *Seminal vesicles*: One pair sacs in 10, projecting extensively into 11. *Spermathecae*: Near septa 11/12 12/13 13/14; moderate in size, elongated ampullae; one pair per segment. *Genital glands*: Flat oval glands, in 15 16 17 18 19 moderate, in 22 23 large.

Biological notes: Collected from grassland, in hard soil near the road. Both old and freshly made, large casts were common. Associated with *Proandricus skeadi* Plisko, 1993. Sperm present in spermiductal funnels in dissected specimens indicates sexual activity in the summer rainy season. In one specimen a large piece of a decomposed tick was found in the anterior part of the intestine near the typhlosole, and small particles of sand.

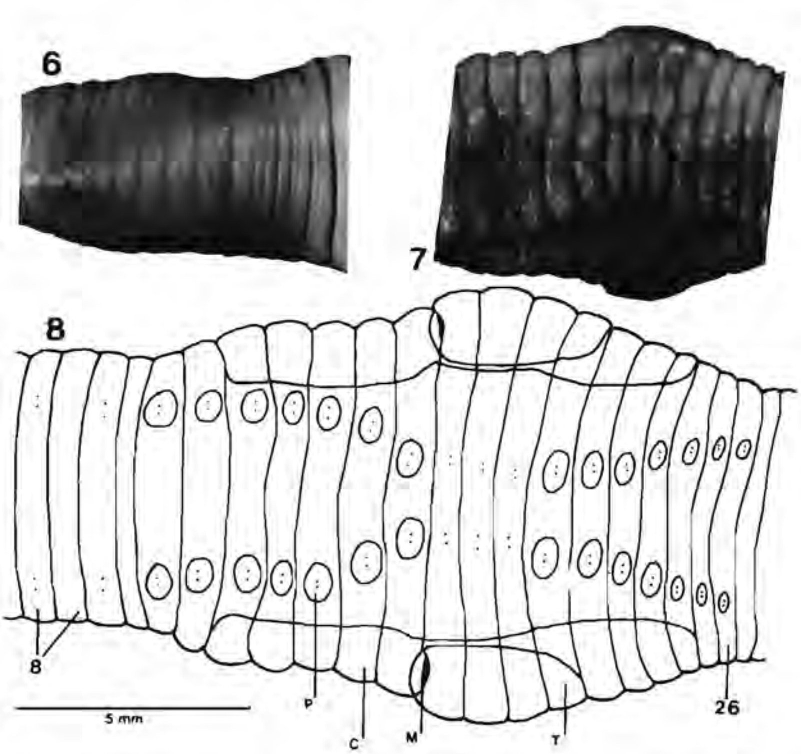
Discussion: Similar to *P. biancae* Plisko, 1993 known from the Alice area (Eastern Cape). Both species have three pairs of spermathecae, with spermathecal pores in 11/12 12/13 13/14 intersegmental furrows, and thickened septa 4/5 7/8 8/9. They differ, however, in the position and shape of the clitellum, tubercula pubertatis, and the very specific shape of the calciferous glands.

Proandricus comptus sp. n.

Figs 6–8

Etymology: L. *comptus* = ornamented. Refers to the characteristic arrangement of papillae in this species.

Material examined: **Eastern Transvaal**: *Holotype* NMSA/Olig.02230, 30 km N. of Lydenburg (25°06'S:30°27'E), at *ca.* 1500 m, from grassland with tall grasses, moist soil, 6 December 1995, JDP and TL leg. *Paratypes*: NMSA/Olig.02305, 1 clitellate abscised postclitellarly, same data as holotype; NMSA/Olig.02222, 30 km NE. of Machadorp (25°40'S:30°15'E) from pasture near small stream, dry sandy soil, 6



Figs 6–8. *Proandricus comptus* sp. n. 6. Preclitellar part. 7–8. Clitellar region, ventral view. (C = clitellum; T = tuberculum pubertatis; P = papilla; M = male porus; numbers refer to segments.)

December 1995, 1 clitellate and 3 juvenile, JDP and TL leg.

Distribution: Known from the northern part of the Drakensberg escarpment.

Description (based on holotype and paratypes):

External characters:

General: Body cylindrical anteriorly and posteriorly; when preserved, flattened in clitellar area. *Colour*: In life dorsally brown, ventrally grey. Alcohol preserved dorsally grey with brownish tint. *Dimensions*: Holotype preserved 160 mm long, 6 mm wide at 10, 9 mm at tubercula pubertatis; clitellate paratype 70+ mm long. *Segment number*: Holotype *ca.* 289 (exact number unknown due to contraction of segments and damage during collection); paratypes 163+ up to 190+. *Prostomium*: Prolobous, with a few longitudinal grooves. *Segmentation* (Fig. 6): Secondary annulation present; 1–2 simple with longitudinal grooves; 3 simple; 4–8 with 2 ringlets similar in size and appearance; 9 with two ringlets, first longer than second; 10–11 simple; clitellar segments simple; postclitellar annulated with 3–4 annuli. *Setae*: Minute, paired; first pairs of *ab* on first ringlet of 4; on 10–16 and 20–26 *ab* associated with papillae; on 15–16 the distance of *ab* decreases, bringing *aa* nearly to 1/3 of the distance on anterior segments; on 17–19 *aa* remains diminished; on 20–25 *aa* increases, and on 26 and the following becomes and remains similar to the distance on anterior segments. *Nephridial pores*: Conspicuous in *cd* setal lines; first pair in 3/4 intersegmental furrow. *Female pores*: A pair of small conspicuous openings on 14, above *b* setal lines. *Male pores*: In 16/17 intersegmental furrow, with glandular swellings. *Spermathecal pores*: Tiny openings in 11/12 and 12/13 intersegmental furrows.

Clitellar region (Figs 7–8): *Clitellum*: Saddle-shaped, yellowish white, clearly bordered anteriorly and posteriorly; on 12–14 with clear intersegmental furrows; ventral edges on 12–14 extended nearly to the lines of papillae; on 20–24 expanded below tubercula pubertatis ventral lines. *Tubercula pubertatis*: On 17–20, laterally; elongated swollen ridges, commence at clitellar lateral lines and extend below *cd* setal lines. *Papillae*: 14 pairs, on *ab* setae, in two groups: first on 10–16; the second on 20–26; the median ventral distance of setae and associated papillae on segments 15 and 16 steadily diminishes, bringing papillae closer to one another; on 20 and 25 the distance increases, so the papillae on segments 26 are in the same lines as those of 10–14.

Internal characters:

Septa: 4/5 5/6 6/7 very thin; 7/8 8/9 thickened very much, muscular, each connected to body wall through the half of the length of associated segments. *Crop*: In 4–5, large. *Gizzard*: Large, muscular. *Calciferous glands*: Not stalked, laterally adherent to oesophagus in 9; dorsally separated by very narrow groove. *Intestine*: Commences in 13. *Typhlosole*: In holotype commences in 14 as narrow V-shaped tube, gradually changing into U-shape; terminates in area of 175. *Dorsal blood vessel*: 4–5 single; 6 partly doubled; 7 doubled in posterior part; 8 doubled, separated; 9 doubled cordiform; 10 doubled; when crossing septa, in 11 and posterior to 11 single. *Paired dorsoventral vessels*: 4–8 thin tubes; 9–11 enlarged, moniliform. *Nephridia*: Meganephridia; large coiled loops with thin, elongated, moderate caeca.

Reproductive organs: *Spermiductal funnels*: A pair of large funnels, enclosed in sacs, closely connected to vesicula seminales. *Seminal vesicles*: One pair vesicles, in 10, projecting into 11. *Spermathecae*: In 2 segments; 3–5 elongated ampullae at each side of segment; openings at septa 11/12 and 12/13. *Genital glands*: Paired, flat, glandular, associated with papillae; in 10–16 and 20–26.

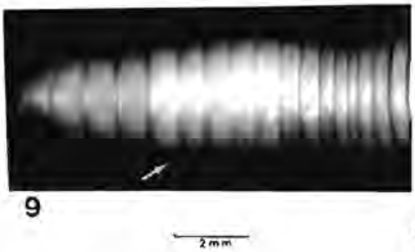
Biological notes: This species was found at *ca.* 1500 m; the holotype and some paratypes were collected from sandy soil covered by tall grasses, near a road. Paratypes were found in pasture soil, close to a small, dry stream bed. In both cases the soil was relatively dry. Sperm was present in spermiductal funnels in dissected specimens, confirming activity at the beginning of summer, early in the rain season.

Discussion: A distinctive species, with a unique arrangement of papillae. It is also exceptional in having lateral unstalked calciferous glands, which are broadly separated ventrally, and narrowly grooved dorsally.

Proandricus setosus sp. n.

Figs 9–10

Etymology: L. *setosus* = bristly. Refers to the medium sized setae, clearly exhibited along the body.



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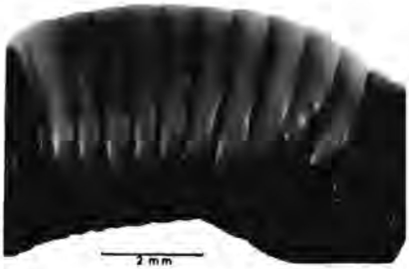

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Figs 9–10. *Proandricus setosus* sp. n. 9. Anterior part, lateral view, with prostomium, single segments 1–3, segments 4–9 with 2 ringlets, and setae (arrowed) on first ringlet. 10. Clitellar region, lateral view.

Material examined: **KwaZulu-Natal**: *Holotype* NMSA/Olig.02031, Kranskop (28°59'S:30°53'E), indigenous forest, from litter and first layer of moist soil, 8 December 1994, JDP and BRS leg. *Paratypes*: NMSA/Olig.02311, 9 clitellate, 9 juvenile collected with holotype.

Distribution: Known only from the type locality.

Description (based on holotype and paratypes):

External characters:

General: Cylindrical along of whole body length. *Colour*: Alcohol preserved whitish grey. *Dimensions*: Preserved, contracted holotype 80 mm long, 4 mm wide at 10, 6 mm in region of tubercula pubertatis; clitellate paratypes 60–85 mm long, juveniles 32–60 mm long. *Segment number*: Holotype 144; paratypes 125–236. *Prostomium*: Prolobous, small. *Segmentation*: Secondary annulation present (Fig. 9): 1 and 2 with no clear segmental separation, both with irregular longitudinal grooves; 3–8 with 2 simple ringlets, similar in size and appearance; 9 with 2 ringlets, first longer than second; 10–11 simple, short; clitellar simple; postclitellar short, simple. *Setae*: Conspicuous, moderate in size, paired; first pairs on 3, subsequent pairs of segments 4–9 on first ringlet; prominent on clitellar and postclitellar segments. *Nephridial pores*: Obvious, below *c* setal lines; first pair in 3/4 intersegmental furrow. *Female pores*: On 14, small openings. *Male pores*: in 14/15 intersegmental furrow, with distinct glands on 14 and 15; below *c* setae. *Spermathecal pores*: One pair per segment; in intersegmental furrows 11/12 and 12/13.

Clitellar region (Fig. 10): *Clitellum*: On 12–22; saddle-shaped, segmented, whitish grey; on 12–13 ventral edges extend slightly above *d* setal lines, on 13–15 to the border of male pores glands, on 16–18 parallel to dorsal border of tubercula pubertatis, on 19–22 ending in the middle of space between *bc* lines. *Tubercula pubertatis*: On 16–18; below clitellar edges, flat, glandular bands, clearly divided by intersegmental furrows, with narrow grooves at ventral borders. *Papillae*: Not seen on holotype; on some of paratypes present as small swellings, paired, in *ab* setal lines, on 10–13.

Internal characters:

Septa: 4/5 much thickened; 7/8 and 8/9 thickened moderately; other septa thin. *Gizzard*: Large, muscular. *Calciferous glands*: In 9; laterally, widely separated dorsally and ventrally. *Intestine*: Commences in 13. *Typhlosole*: U-shaped tube, commences in 17; terminates in holotype in 93, in dissected paratype in 96. *Dorsal blood vessel*: Single in 4–5; 6 partly doubled; in 7 doubled, in 8 doubled, separated; in 9 cordiform organ; crossing septa, in 10 and the following simple. *Paired dorsoventral vessels*: Thin tubes in 4–8; enlarged, moniliform in 9–11. *Nephridia*: One pair of meganephridia per segment; paired small tufts of coiled tubules, with thin, elongated tube and caeca.

Reproductive organs: *Spermiductal funnels*: A pair of funnels enclosed in one sac, closely connected with vesiculae seminales. *Seminal vesicles*: One pair in 10, thin sacs, and much larger in 11. *Spermathecae*: 2 pairs; elongate ampullae, with short, thin neck, close to septa 11/12 12/13; second pair much larger than first. *Vasa deferentia*: Single ducts, extend to posterior part of 14, where they enter body wall. *Ovaries*: in 13. *Genital glands*: Small, flat glands associated with *ab* setae, in 14, 15–18.

Biological notes: Common at the type locality in indigenous forest, near a small stream. The site is in a small, steep-sided valley adjacent to the road from Kranskop, on the south side of the Thukela Valley. Degradation of the forest and pollution of the stream were in evidence because of human activities and settlement in the area. Associated with this new species were species of *Tritogenia*, and the acanthodrilids, present in considerable numbers.

Discussion: This species is similar to *P. modestus* (Michaelsen, 1899). Both are characterised by a much thickened septum 4/5 and two pairs of spermathecae in 11/12, 12/13. Differs in the shape and location of the clitellum and tubercula pubertatis. The noticeably large setae also distinguish *setosus* from other proandric species.

Proandricus sirgeli sp. n.

Figs 11–12

Etymology: Named in honour of Dr W. F. Sirgel, who discovered this species.

Material examined: **Southwestern Cape**: *Holotype* NMSA/Olig.02001, Hottentots-Holland Nature Reserve, Hottentots Holland hiking trial, opposite Landdroskloof (34°02'S:18°59'E), on eastern slope of mountain, at *ca.* 1350 m, on walking path, on rainy day, 7 September 1994, W. F. Sirgel leg.

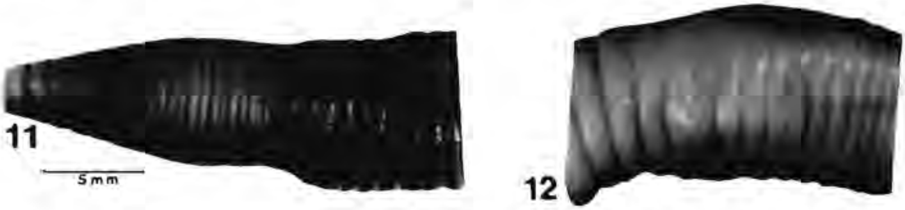
Distribution: Known only from the type locality.

Description (based on holotype):

External characters:

General: Body cylindrical, slightly flattened in clitellar region. *Colour*: Alcohol preserved whitish grey. *Dimensions*: Preserved, contracted 150 mm long, 10 mm wide at 10, 13 mm in region of tubercula pubertatis. *Segment number*: 277. *Prostomium*: Prolobous, small. *Segmentation*: Secondary annulation present (Fig. 11): 1 and 2 simple, short, with irregular longitudinal grooves; 3–5 with 2 simple ringlets, similar in size and appearance; 6–8 with 2 ringlets, each with 2 short annuli; 9–10 with 2 annuli; clitellar segments much larger, dorsally simple, ventrally irregularly annulated; postclitellar segments short, simple, randomly irregularly annulated. *Setae*: Minute, closely paired, on first ringlet; first pairs on 3. *Nephridial pores*: Obvious, below *c* setal lines; first pair in 2/3 intersegmental furrow. *Female pores*: On 14, small openings between *aa*. *Male pores*: On 19, below *c* setae. *Spermathecal pores*: A pair of tiny openings in intersegmental furrows 12/13 13/14 14/15 15/16.

Clitellar region (Fig. 12): *Clitellum*: Saddle-shaped, segmented, whitish grey; expanding between *b* setal lines; on 1/n10–22. *Tubercula pubertatis*: On 17–20, below clitellar edges, flat, glandular bands, clearly divided by intersegmental furrows, with irregular longitudinal grooves. *Papillae*: Small swellings, paired, in *ab* setal lines, on 10–23.



Figs 11–12. *Proandricus sirgeli* sp. n. 11. Anterior part, dorsolateral view. 12. Clitellar region, dorsolateral view.

Internal characters:

Septa: 4/5 and 5/6 thickened moderately, similar in thickness and appearance; 7/8 and 8/9 thickened more than 4/5; other septa very thin. *Gizzard*: Large, muscular, in 7. *Calciferous glands*: In 9; short, muscular, with rudimentary dorsal groove. *Intestine*: Commences in 13. *Diverticula*: In 13–19 externally on intestine, dorsolateral, 7 pairs, irregularly-shaped, containing black humus with decayed vegetable matter and single pieces of partly digested moss. *Typhlosole*: Narrow U-shaped tube, commences at start of intestine; terminates in 150. *Dorsal blood vessel*: Undivided in 4–7; small cordiform organ in 8; in 9 and the following segments simple. *Paired dorsoventral vessels*: Thin tubes in 4–7; enlarged in 8–11. *Nephridia*: One pair of meganephridia per segment; paired small tufts of coiled tubules, with thin, elongated tube, and short caeca.

Reproductive organs: *Spermiductal funnels*: One pair small funnels enclosed in one sac, closely connected with vesiculae seminales. *Seminal vesicles*: One pair in 11, large sacs, broad ventrally, much thinner dorsally. *Spermathecae*: 4 pairs, spherical, with very short, thin neck, close to septa 12/13 13/14 14/15 15/16; large in 12 13 14, much smaller in 15. *Ovaries*: In 13. *Genital glands*: 13 pairs in 10–22, finger-shaped, medium size; associated with *ab* setae; some with genital setae.

Biological notes (supplied by Dr W. F. Sirgel): The species was found on a rainy day, on an eastern slope covered by a thin layer of black soil. This side of the mountain being exposed to the sun, becomes (during the summer season) hot and dry. The worms may move into deep soil during the dry season or migrate to the southwestern slopes a few hundred metres away, where ecological conditions may be more stable, and the soil is sheltered by a layer of moss, litter and a dense growth of Cypraceae.

The holotype was associated with a juvenile acanthodrilid.

Discussion: This is a distinctive species as it has four pairs of spermathecae, a character not previously found in *Proandricus*. Seven pairs of short, external diverticula in 13–19 are rarely recorded in microchaetids, and ring-shaped calciferous glands are also exceptional.

DISCUSSION

The genus *Proandricus* is characterised by the possession of testes and spermiductal funnels in segment 10 (a proandric character). In the majority of species, the spermathecae and their pores occur in the segments behind the testes and the spermiductal funnels. At the same time the occurrence of spermathecal pores in the 12/13 intersegmental furrow is typical for this genus (30 species). The exceptions are only the previously described species *lesothoensis* and *pajori*, and *bourquini* described in this paper. In these species the spermathecal pores occur in front of the segment including the male terminalia (in 9/10 and 10/11, or only in 10/11). This character distinguishes the three species from all other proandric species.

The other characteristic worth stressing is the number of intersegmental furrows occupied by spermathecal pores. In most proandric species these pores occur in two intersegmental furrows (23 species). In five species spermathecal pores occur in three furrows. Four species have only one pair of small openings. In *P. sirgeli*, spermathecal pores occur in four intersegmental furrows (12/13, 13/14, 14/15, 15/16), making this a distinctive species.

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